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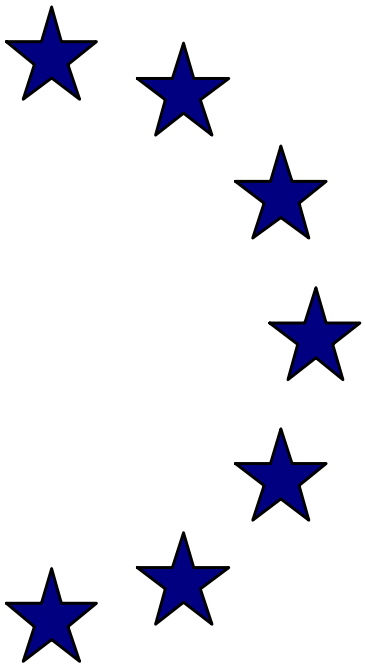

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Capital structure and international debt shifting

by

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Capital Structure and International Debt Shifting

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Abstract

This paper presents a model of a multinational firm's optimal debt policy that incorporates international taxation factors. The model yields the prediction that a multinational firm's indebtedness in a country depends on a weighted average of national tax rates and differences between national and foreign tax rates. These differences matter as multinationals have an incentive to shift debt to high-tax countries. The predictions of the model are tested using a novel firm-level dataset for European multinationals and their subsidiaries, combined with newly collected data on the international tax treatment of dividend and interest streams. Our empirical results show that corporate debt policy indeed not only reflects domestic corporate tax rates but also differences in international tax systems. These findings contribute to our understanding of how corporate debt policy is set in an international context.

Key words: corporate taxation, financial structure, debt shifting

JEL classifications: F23, G32, H25

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1. Introduction

In most countries, interest expenses are deductible for corporate tax purposes while dividends have to be paid out of net-of-tax corporate income. Most tax systems thus favor debt finance over equity finance, but to different degrees given the dispersion in top corporate tax rates. In determining their financial structure, purely domestic firms only have to deal with the domestic tax system. Multinational firms, however, face the more complicated choice of determining their overall indebtedness and the allocation of their debts to the parent firm and the subsidiaries across all countries in which the multinational operates. As a consequence, the financial structure of a multinational firm is expected to reflect the tax systems of all the countries where it operates.

In an international setting, the tax costs of debt and equity finance depend on the combined tax systems of the subsidiary and parent countries of the multinational firm. Dividends, as indicated, have to be paid out of the subsidiary's income after subsidiary-country corporate tax and in addition may be subject to a non-resident dividend withholding tax in the subsidiary country. In the parent country, the dividend income may again be subject to corporate income tax. If so, double tax relief may or may not be provided for the previously paid corporate income and non-resident withholding tax. The tax costs of equity finance thus reflect tax rates as well as the double-tax relief convention used by the parent country. This paper collects detailed information on all of these aspects of the international tax system for European multinationals.

A firm's financial policies are affected by tax as well as non-tax considerations. A non-tax consideration is that indebtedness of the overall multinational firm should not be too high to keep the probability of costly bankruptcy low. In contrast, an advantage of debt finance is that it reduces the free cash flow within the firm and hence can act as a disciplining device for otherwise overspending managers. The disciplining properties of debt finance can explain generally positive debt levels at each of a multinational's individual establishments (i.e., its parent company and its foreign subsidiaries). These various considerations give rise to an optimal overall capital structure for the overall multinational firm for non-tax reasons.

This paper first presents a model of the optimal overall capital structure of the multinational firm reflecting tax and non-tax factors. Generally, the tax advantages of debt finance lead the firm to choose a higher leverage than would be desirable for purely non-tax reasons. At the same time, a change in tax policy optimally causes the firm to rebalance its capital structure in all the countries where it operates. Specifically, stronger incentives for debt finance in one country encourage debt finance in that country but at the same time discourage debt finance in other countries to keep the overall indebtedness of the multinational in check. The model yields the result that the optimal debt to assets ratio at any establishment of the multinational is positively related to the national tax rate and to differences between the national and foreign tax rates. The relevant tax rates in this regard are the effective tax rates that take into account any double taxation and double taxation relief. International tax rate differences matter, as they determine the incentives to shift debt internationally within a multinational firm.

Next, the paper presents evidence on the impact of taxation on firm indebtedness for a sample of 33 European countries over the 1994-2003 period using a unique firm-level database on the financial structure of domestic and multinational firms, including their parent companies and their subsidiaries. For stand-alone domestic firms, we estimate that a 10 percent increase in the overall tax rate (reflecting corporate income taxes and non-resident dividend withholding taxes) increases the ratio of liabilities to assets by 1.84%. For

multinational firms, the leverage ratio is found to be more sensitive to taxation on account of international debt shifting. As an example, we can consider a multinational with two equal-sized establishments in two separate countries. A 10 percent overall tax increase in one country is found to increase the leverage ratio in that country by 2.44%, while the leverage ratio in the other country decreases by 0.6%. Corporate debt policy appears to reflect local, source-level taxes rather than residence-level taxes levied on a multinational's worldwide income, perhaps because these latter taxes can often be deferred. Similarly, debt policy appears to reflect corporate income taxation rather than bilateral non-resident dividend withholding. In practice, multinationals may be able to avoid bilateral withholding taxes through triangular arbitrage involving a conduit company in a third country.

Several authors consider the relationship between firm leverage and taxation with U.S. data. Among these, MacKie-Mason (1990) and Gordon and Lee (2001) identify a tax effect by exploiting the different effective taxation faced by previously loss-making firms and firms of different sizes, respectively. Graham (2000) calculates the value of the tax benefits of debt finance for the U.S. case. Using Italian data, Alworth and Arachi (2001) found a positive effect for both the corporate and the personal income tax rates on financial leverage. Studies that use cross-country data have the advantage that they allow for international variation in tax rates. Examples are Rajan and Zingales (1995) and Booth, Aivazian, Demirgüc-Kunt and Maksimovic (2001). The latter set of authors finds a weak effect on leverage for a tax variable that measures the tax shield of debt finance. Next, there is a set of papers that consider the debt finance of multinationals with either parent companies or subsidiaries in the United States. Specifically, Hines and Hubbard (1990), Collins and Shackelford (1992), Froot and Hines (1992), Grubert (1998) and Altshuler and Grubert (2003) provide evidence that U.S. multinational financial structure and the pattern of intra-firm interest and other income flows are consistent with tax minimization objectives. Using German data, Ramb and Weichenrieder (2004) find that the financial structure of foreign affiliates in Germany are partly tax motivated, and Mintz and Weichenrieder (2005) find that a one percentage-point increase in the host country's tax rate raises leverage by about .4 percentage-point. Newberry and Dhaliwal (2001) find that the debt issuance location of U.S. multinationals is affected by these firms' jurisdiction-specific tax-loss carry-forwards and binding foreign tax credit limitations on the value of debt tax shields. Desai, Foley and Hines (2004) find that both the internal and external financing of outward U.S. FDI is sensitive to foreign tax rates. Mills and Newberry (2004) analogously find that non-U.S. multinationals from countries with relatively low tax rates use relatively intensive debt finance of their foreign controlled corporations in the United States.

Jog and Tang (2001) consider the leverage of firms in Canada that may or may not be part of U.S.-based or Canadian-based multinationals. The debt-to-assets ratios of Canadian corporations without foreign affiliates are found to be more sensitive to Canadian tax rates than the debt-to-assets ratios of U.S. controlled corporations located in Canada. Using data for member countries of the European Union, Moore and Ruane (2005) examine the leverage of 8,500 foreign subsidiaries. They find that leverage ratios of these subsidiaries are sensitive to the local corporate tax rate, unless the parent country operates a foreign tax credit system. This paper nests the approaches of the latter two papers by considering how both multinational firm structure and the international tax system affect leverage in Europe. Hence, we take into account whether a firm is a parent or a subsidiary of a multinational or a domestic firm. At the same time, we account for the tax systems of all the countries where the multinational operates. Thus, unlike previous research, our modeling and our empirical work take a fully multilateral approach and is the first to study the effect of taxation on leverage in a nxn countries context. The main contribution of our paper is to explore in an international context the possibility that multinationals set the capital structure of individual subsidiaries by

taking into account the tax rate faced by all other subsidiaries of the firm. Our finding that subsidiary leverage within a multinational firm responds to bilateral tax rate differences vis-à-vis both the parent firm and other foreign subsidiaries provides direct support for this multilateral approach.

In the remainder, Section 2 describes the international tax treatment of the debt and equity finance of multinational firms. Section 3 presents the model. Section 4 discusses the company-level data. Section 5 presents the empirical results. Section 6 concludes.

2. The international tax system

This section describes the main features of the corporate income tax system applicable to a multinational firm with subsidiaries in one or more foreign countries.[1] To fix ideas, let us consider a multinational firm that operates a foreign subsidiary in country *i* and has the parent firm in country *p*. The deductibility of interest from corporate income implies that there is no corporate taxation of interest to external debt holders. Dividends paid by the subsidiary to the parent firm in contrast are generally subject to corporate taxation in at least one country.

The subsidiary's income in county *i* is first subject to the corporate income tax t_i in this country. Table 1, column (a) indicates the statutory corporate tax rate on corporate profit for a sample of 33 European countries in 2003. These tax rates include regional and local taxes as well as specific surcharges. Germany has the highest tax rate at 39.6 percent, while Cyprus and Lithuania are at the bottom with a tax rate of 15 percent. This and all other tax system information in this paper has been collected from the International Bureau of Fiscal Documentation and various websites of national ministries of finance. For illustrative purposes, Tables 1 to 5, we report the figures for the taxation variables for the year 2003.

The subsidiary pays out its after-tax corporate income as a dividend to the parent company. The subsidiary country may levy non-resident a withholding tax w_i^e on this outgoing dividend income. Bilateral dividend withholding taxes in Europe for 2003 are presented in Table 2. These rates are zero in the majority – but not in all – of cases. Specifically, they are zero among long-standing EU member states on account of the Parent-subsidiary directive. New EU member states such as the Czech Republic, Hungary, Poland and Slovenia still maintain non-zero dividend withholding taxes vis-à-vis considerable numbers of European countries. Non-EU member states such as Bulgaria, Romania, Russia and Turkey similarly maintain non-zero dividend withholding taxes in a considerable number of cases. The combined corporate and withholding tax rate in the subsidiary country is seen to be $1-(1-t_i)(1-w_i^e)$ or $t_i + w_i^e - t_i w_i^e$.

The parent country subsequently may or may not use its right to tax the income generated abroad. In case the parent country operates a territorial or source-based tax system, it effectively exempts foreign-source income from taxation. The effective marginal tax on income reported in country *i*, denoted τ_i, in this instance equals combined corporate and

[1] It is reasonable to assume that multinationals do not take into account the taxation of dividend, interest and capital gains at the investor level. First, important institutional investors such as pension funds may not be subject to taxation of the investor level. Second, private investors generally are subject to such taxation, but the internationally dispersed ownership of the shares of a multinational firm makes it difficult for these firms to take taxation at the personal level into account when deciding on their financing.

withholding tax $t_i + w_i^e - t_i w_i^e$ in country *i*.[2] Alternatively, the parent country operates a worldwide or residence-based tax system. In this instance, the parent country subjects income reported in country *i* to taxation, but it generally provides a foreign tax credit for taxes already paid in country *i* to reduce the potential for double taxation. The OECD model treaty, which summarizes recommended practice, in fact gives countries an option between an exemption and a foreign tax credit as the only two ways to relieve double taxation (see OECD, 1997). The foreign tax credit reduces domestic taxes on foreign source income one-for-one with the taxes already paid abroad. The foreign tax credit can be indirect in the sense that it applies to both the dividend withholding tax and the underlying subsidiary country corporate income tax. Alternatively, the foreign tax credit is direct and applies only to the withholding tax. In either case, foreign tax credits in practice are limited to prevent the domestic tax liability on foreign source income from becoming negative.

In the indirect credit regime, the multinational will effectively pay no additional tax in the parent country, if the parent tax rate t_p is less than $t_i + w_i^e - t_i w_i^e$. The multinational then has unused foreign tax credits and is said to be in an excess credit position. Alternatively, t_p exceeds $t_i + w_i^e - t_i w_i^e$. In that instance, the firm pays tax in the parent country at a rate equal to the difference between t_p and $t_i + w_i^e - t_i w_i^e$. The effective, combined tax rate on the dividend income, τ_i, then equals the parent country tax rate, t_p. To summarize, with the indirect credit system the effective rate on income generated in country *i*, τ_i, is given by max $[t_p, t_i + w_i^e - t_i w_i^e]$. In case of a direct foreign tax credit, the multinational analogously pays no additional tax in the parent country, if the parent tax rate t_p is less than w_i^e. In the more common case where t_p exceeds w_i^e, the firm instead pays tax in the parent country at a rate equal to $(1-t_i)(t_p - w_i^e)$. The effective, two-country tax rate, τ_i, with the direct credit system is now given by $t_i + (1-t_i)\max[t_p, w_i^e]$. A few countries with worldwide taxation do not provide foreign tax credits, but instead allow foreign taxes to be deducted from the multinational's taxable income. Under this deduction method, foreign taxes are essentially seen as a tax-deductible cost of seeing business at par with other business costs. In the scenario, the effective rate of taxation on dividends, τ_i, is given by $1-(1-t_i)(1-w_i^e)(1-t_p)$.

Columns (b) and (c) of Table 1 provide information on the double taxation rules applied to incoming dividend. As reflected in the table, several countries are seen to discriminate between international tax treaty partners and non-treaty countries. Finland and Spain, for instance, exempt dividend income from treaty partners, while they provide a direct and indirect foreign tax credit in case of non-treaty counties, respectively. Note that signing a tax treaty makes the granted double tax relief more generous in these instances. The tendency to discriminate double tax relief on the basis of the existence of a tax treaty makes it necessary to know whether a bilateral tax treaty is indeed effective. Table 3 indicates with a binary variable whether any two countries had a tax-treaty in force by 2003.[3] Across the categories of treaty and non-treaty countries, the exemption system is seen to be the most common

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[2] Note that for the parent firm we have that the effective tax rate on corporate income equals the statutory rate, or $\tau_p = t_p$.

[3] Most of the 33 countries in our sample had such treaties with each other. However, the treaty network of some countries – in particular some of the new EU member states and some non-EU countries – are far from complete. In contrast, France, Germany, Norway, Poland, Sweden and the United Kingdom have a double-tax treaty in force with all other countries. Note that the table is not exactly symmetric because the entry into force may slightly differ in each of the two treaty partners.

method of double tax relief, followed by foreign tax credits. At the same time, indirect foreign tax credits regimes are somewhat more common than direct foreign tax credits. As an exceptional case, the Czech Republic is seen to apply the deduction method to foreign dividends from non-treaty countries, while Russia and Slovak Republic provide no double tax relief at all to such income.

In practice, multinationals use equity as well as internal debt to provide own resources to their foreign subsidiaries. Thus, leverage is likely to be affected by the taxation of dividends, as considered so far, and by the taxation of interest on internal debt. To reflect this in our empirical work, we use a variable φ_i to denote the effective tax rate on cross-border dividends, i.e. τ_i, minus an analogous effective rate of tax on interest. Interest on internal debt is generally deductible from taxable corporate income in the subsidiary country. Such interest income thus escapes corporate income tax in the subsidiary country. As in the case of dividends, cross-border interest flows within the multinational firm may generally be subject to a non-resident withholding tax in the subsidiary country. Let w_i^d denote the bilateral non-resident interest withholding tax. As seen in Table 4, these tax rates are mostly zero on a bilateral basis for the countries in our sample, even if Belgium, Estonia, Latvia, Portugal and Romania continue to impose positive interest withholding taxes vis-à-vis almost all countries in our sample. As applied to internal interest flows, the parent country has three main options regarding double tax relief: (i) an exemption, (ii) a foreign tax credit, or (iii) a deduction. Table 5 provides information on the double taxation rules applicable to incoming interest from treaty and non-treaty signatory countries, respectively. The signing of a tax treaty, if anything, makes the double tax relief in case of interest flows more generous. Foreign-source interest flows are seen to benefit from a foreign tax credit in most countries, particularly in the case of interest payments originating from treaty partners. Clearly, the taxation of dividend income relative to interest income, φ_i, depends on the possibly different tax relief granted for dividends and for interest. Expressions for φ_i in the various possible combinations of double tax relief granted for dividend and interest income are provided in Table 6.

3. The model

The model considers a multinational that generally operates in n countries. The multinational is domiciled in country p, while it has foreign subsidiaries in one or more countries i with assets A_i. The subsidiary is financed with debt L_i, which for now we take to be external debt, and equity E_i. Hence, the balance sheet identity of a subsidiary implies $A_i = L_i + E_i$. The parent firm fully owns each subsidiary's equity E_i. In addition, the parent firm owns 'outside' assets A_p. The parent firm in turn can be financed through either debt L_p or equity E_p. Thus, the balance sheet identity for the parent can be stated as $A_p + \sum_{i \neq p}^{n} E_i = L_p + E_p$.

Let λ_i be the ratio of debt to assets for each establishment of the multinational - i.e. $\lambda_i = \frac{L_i}{A_i}$. Analogously, let λ_f be the debt to assets ratio for the entire firm, i.e. $\lambda_f = \frac{\sum_{i=1}^{n} L_i}{\sum_{i=1}^{n} A_i}$. Alternatively, we can write λ_f as the asset-weighted average of the establishment-specific debt ratios λ_i as $\sum_{i=1}^{n} \lambda_i \rho_i$, where $\rho_i = \frac{A_i}{\sum_{i=1}^{n} A_i}$ are the assets of establishment i as a share of the

firm's total assets. Throughout, we will assume that the assets A_i of subsidiary i and the parent firm's 'outside' assets A_p given.[4]

In deciding its financial structure, the multinational firm takes taxation as well as non-tax factors into account.[5] To start with the latter, the multinational recognizes that higher leverage increases the chance of bankruptcy. We will assume that the parent firm provides credit guarantees for the debts of all its subsidiaries. This implies that the chance of bankruptcy of the overall multinational firm depends on the firm-wide leverage ratio λ_f. Specifically, we will assume that expected bankruptcy costs, C_f, of the firm are quadratic in the overall leverage ratio λ_f and proportional to the firm's overall outside assets as follows[6]

$$C_f = \frac{\gamma}{2}(\lambda_f)^2(\sum_{i=1}^{n} A_i) \qquad (1)$$

Next, it is recognized that leverage may bring benefits in that it disciplines local managers and aligns their incentives more closely to those of the firm. High leverage at a subsidiary may, for instance, serve to prevent local managers from overspending on perks for themselves to prevent de jure bankruptcy of the subsidiary. On the other hand, high leverage may have the disadvantage of making local managers too risk-averse to the point where they do not make appropriate local investment decisions. In either case, the incentive effects of leverage are assumed to stem from the local leverage ratio λ_i for establishment i.[7] On the basis of these incentive considerations alone, let λ^* be the optimal leverage ratio at each of the multinational's establishments. Deviations of the leverage ratio at any establishment from the level λ^* are assumed to imply incentive-related costs to the firm. These costs are assumed to be quadratic in λ_i and now they are proportional to the outside assets A_i at establishment i as follows:

$$C_i = \frac{\mu}{2}(\lambda_i - \lambda^*)^2 A_i - \frac{\mu}{2}\lambda^{*2} A_i \qquad i=1,\ldots, n \qquad (2)$$

Note that these cost functions are scaled to equal zero if the debt ratios λ_i are zero, which implies that C_i can be of either sign. Next, let V_l and V_u be the values of the levered and completely unlevered multinational firm, respectively. The two are different on account of the tax benefits of debt finance and of the (net) non-tax costs associated with debt finance. Specifically, V_L and V_u are related as follows

$$V_L = V_u + \sum_{i=1}^{n} \tau_i L_i - C_f - \sum_{i=1}^{n} C_i \qquad (3)$$

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[4] In response to a change in E_i, the parent firm thus will change either L_p or E_p rather than A_p.

[5] See Hovakimian, Hovakimian and Tehranian (2004) for a recent discussion of the theoretical and empirical literature on target capital structures reflecting various costs and benefits of debt and equity.

[6] Bankruptcy costs are incurred by loss-making firms and hence are assumed not to be deductible from taxable corporate income.

[7] Higher local leverage may be disadvantageous if it increases the probability of losses that cannot be credited against profits made elsewhere in the firm. Losses that are not creditable per definition reduce the after-corporate-tax income of the firm one-for-one. For this reason, we assume that the costs associated with higher leverage at the establishment level are not deductible from taxable corporate income.

where τ_i again is the rate of taxation of dividend income relative to interest income in locale *i* taking into account the overall international tax system.

The multinational firm's objective is to maximize its overall firm value V_L in the leveraged state. Its instruments are the debt levels L_i at each establishment.[8] The first order conditions w.r.t. L_i – written in terms of leverage ratios - are given by

$$\tau_i - \gamma\lambda_f - \mu(\lambda_i - \lambda^*) = 0 \quad i=1,\ldots, n \tag{4}$$

The first order conditions jointly allow us to solve for the optimal value of λ_i as follows:

$$\lambda_i = \beta_0\lambda^* + \beta_1\tau_i + \beta_2\left[\sum_{j\neq i}^{n}(\tau_i - \tau_j)\rho_j\right] \quad i=1,\ldots,n \tag{5}$$

where $\beta_0 = (\frac{\mu}{\gamma+\mu})$, $\beta_1 = \frac{1}{\gamma+\mu}$, and $\beta_2 = (\frac{\gamma}{\mu(\gamma+\mu)})$.

In expression (5), the term $\beta_0\lambda^*$ is the optimal leverage ratio at all establishments on the basis of all non-tax considerations, or equivalently if all the τ's are equal to zero. The term $\beta_0\lambda^*$ can be seen to balance the expected costs of bankruptcy (with a value of λ above zero) against the costs of deviating from the optimal value of the leverage ratio λ^* on the basis of incentive considerations. Expression (5) further contains two tax-related terms. First, the term $\beta_1\tau_i$ reflects the impact of taxation on the optimal leverage ratio that would obtain for a purely domestic firm located in country *i*. For this reason, this term is dubbed the 'domestic' effect of taxation on leverage. Second, the term $\beta_2\left[\sum_{j\neq i}^{n}(\tau_i - \tau_j)\rho_j\right]$ reflects the impact of international tax rate differences on the optimal leverage in country *i* on account of international debt shifting. Interestingly, this term weight the international tax differences $\tau_i - \tau_j$ by the asset shares ρ_j. This reflects that the cost function C_i implies that it is relatively painless to shift (absolute) debt into or out of country *j,* if the assets in this country are relatively large. This second effect of taxation on leverage in country *i* is named the 'international' or 'debt-shifting' effect. Note that leverage λ_i in country *i* is negatively related to τ_j on account of the 'debt-shifting' effect.

The theoretical equation (5) gives rise to the following regression equation

$$\lambda_i = \alpha_i + \beta_1\tau_i + \beta_2\left[\sum_{j\neq i}^{n}(\tau_i - \tau_j)\rho_j\right] + \varepsilon_i \qquad i=1,\ldots,n \tag{6}$$

where α_i is a country-specific fixed effect and ε_i is an error term. In the benchmark case, the sample will consist of observations for all subsidiaries to the exclusion of parent firms.[9] In

[8] The firm recognizes all subsidiary and parent firm balance sheet identities, which means that the E_i are co-determined.

practice, a range of firm-level and country-level control variables is included in the estimation.

4. The data

The data on multinational firms are taken from the Amadeus database compiled by Bureau Van Dijk.[10] This database provides accounting data on private and publicly owned European firms as well as on their ownership relationships. These ownership data allow us to match European firms with their domestic subsidiaries and subsidiaries located in other European firms. A firm is defined to be a subsidiary, if at least 50 percent of the shares are owned by another single firm. A multinational firm has at least one foreign subsidiary. Multinational firms tend to provide consolidated and unconsolidated accounting statements. Consolidated statements reflect the activities within the parent companies themselves and of all domestic and foreign subsidiaries. Non-consolidated statements in contrast reflect the activities directly within the parent firm and in each of its subsidiaries. The data we use on parent firms and subsidiaries are based on non-consolidated statements.

Information on the number of parent companies and subsidiaries - domestic and foreign in our data set – is provided in Panel A of Table 7. The total number of parent companies is 5,791, while the total number of subsidiaries is 13,307. We have up to 10 years of data for each parent company and subsidiary for a total of 38,736 parent-year observations and 90,599 subsidiary-year observations. Note that Amadeus only provides information on subsidiaries located in one of the European countries listed in the table.[11] France, Spain and the United Kingdom each are home to at least 4,000 parent companies in the data set. Each subsidiary has a home country (i.e. the country of its parent company) and a host country where the subsidiary is located (therefore, for domestic subsidiaries, home and host countries are the same). For each country, the table lists the number of subsidiaries by home country and by home country. The table reveals that, for instance, Germany and the Netherlands are the home country to relatively many subsidiaries. Hence, there are relatively many subsidiaries with a parent firm in one of these countries. Croatia, the Czech Republic and Romania instead are the host country to relatively many subsidiaries.

Panel B of Table 7 provides information on financial leverage and applicable tax rates. First, financial leverage is defined as the ratio of total liabilities to total assets (see the Appendix for variable definitions and data sources). Adjusted financial leverage, instead, is the ratio of, in the numerator, total liabilities minus accounts payable minus cash to, in the denominator, total assets minus accounts payable minus cash. These adjustments reflect that accounts payable are liabilities that reflect current operations rather than efforts to optimize the firm's capital structure. Similarly, the subtraction of cash reflects that cash may be on hand to pay off existing debts. In Panel B of Table 7, we see that the average parent company financial leverage of 0.62 indeed exceeds the average adjusted financial leverage of 0.49.

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[9] In this instance, the country fixed effect in part can serve to reflect so-called thin capitalization rules that may limit the tax benefits (in terms of interest deductibility) associated with subsidiary indebtedness.

[10] The database is created by collecting standardized data received from 50 vendors across Europe. The local source for this data is generally the office of the Registrar of Companies.

[11] The Amadeus database only contains information on European firms and we therefore only cover the European operations of the multinationals in our sample. We can therefore not consider how tax differences between European countries and other parts of the world affect the capital structure of subsidiaries in Europe. While this is an important caveat to be mentioned, we do not see this as a major limitation of our analysis because European multinationals typically derive much of their revenues from operations in Europe rather than other parts of the world.

Average financial leverage ranges from 0.36 for Russia and Slovenia to 0.80 for Romania. Interestingly, subsidiaries by host country have average financial leverage and adjusted financial leverage of 0.62 and 0.49, respectively – exactly equal to the averages for parent firms. Hence, there is no tendency for subsidiaries to be either more or less leveraged than parent firms. Next, the effective tax rate for subsidiaries by host country is seen to be highest for Germany at 0.49, and lowest for Estonia at 0.14. As discussed before, the effective tax reflects the taxation of dividends in the host country itself as well as the tax treatment of this income in any foreign parent country. The tax incentive to shift debt for subsidiaries by host country is the asset-weighted difference of the effective tax rate in the host country and the effective tax rates applicable to other establishments of the same multinational firm. A positive value of this variable indicates that multinationals on average have an incentive to shift debt out of a particular host country. By this measure, subsidiaries hosted in Iceland and Germany have the largest incentive to attract debt, while subsidiaries located in Estonia and Hungary have the largest incentive to shift debt away.

Panel C of Table 7 provides summary statistics of our leverage and tax variables as well as of control variables included in the subsequent estimation. The control variables are several firm-level variables derived from the firm's balance sheet or income statement as well as some country variables. Among the firm-level variables, tangibility is defined as the ratio of fixed assets to total assets. This variable captures that it may be relatively easy to borrow against fixed assets. In addition, depreciable assets may act as a non-debt tax shield and is therefore a substitute for debt in taxable profit minimization strategies. Next, log of sales is the logarithm of sales. This is a scaling variable to reflect that larger firms may have easier access to credit. Next, profitability is the ratio of earnings before interest, taxes, depreciation and amortization to total assets. Profitability may affect leverage in several ways. Profitable firms may be perceived to be relatively riskless, which would facilitate their access to credit. On the other hand, profitable firms may use their profits to pay down their debts or alternatively to finance investments through retained earnings. In either way, high profitability may lead to a low leverage. Among the country variables, creditor rights is an annual index of creditor rights in a country. Well-protected creditor rights are expected to encourage leverage. Next, political risk is an annual index of political risks. High political risks may encourage borrowing from local creditors, as this is a way to reduce a multinational's value at risk in a country. Inflation is the annual percentage change in the consumer price index. High inflation increases the value of the tax deductibility of interest to the extent that inflation leads to higher nominal interest rates. At the same time, an inflationary environment may also lead to a higher risk premium as part of the nominal interest rate, which discourages debt finance. Finally, the growth opportunities variable measures the median annual growth rate of sales in an industry in a particular country. Growth opportunities signal future profitability and possibly an ability to borrow.

5. Empirical results

Table 8 presents our basic regressions. The sample consists of all European subsidiaries in Amadeus. For each observation, an effective tax rate and a debt shifting incentive variable can be constructed. All regressions in the table provide for parent, industry and year fixed effects. Regression (1) includes the effective tax rate to the exclusion of the international debt shifting incentive variable. The pertinent coefficient is estimated to be 0.259 and statistically significant.[12] The tangibility variable has a negative coefficient, which suggests that debt and tangible, depreciable assets are substitutes. The log of sales enters

[12] Desai, Foley and Hines (2004) similarly find a coefficient of 0.2624 in their regression (1) in Table II where they regress leverage ratios of U.S. outward FDI on the source country tax rate.

positively. Profitability, in turn, obtains a negative coefficient, which suggests that the overall effect of higher profitability is to reduce leverage. Note that the 71,355 observations in the sample are associated with a total of 5,566 parent companies. Yearly observations of the same subsidiary are counted separately.

Regression (2) includes the debt shifting incentive variable. The estimated coefficient for this variable is positive and statistically significant, which confirms that leverage at any subsidiary of a multinational reflects the overall international tax system faced by the multinational. Next, regression (3) includes a set of additional, country-level controls. The creditor rights variable enters the regression positively and significantly. The political risk variable is equally positively and significantly related to leverage. As indicated, this may reflect that political risks lead a multinational to increase local borrowing in order to reduce its own capital at risk. Next, inflation has a negative and significant impact on leverage. This could reflect that in an inflationary environment there is more uncertainty about the ex post real interest rate to be paid on nominal debt denominated in the local currency. Finally, the growth opportunities variable enters the regression positively and significantly. High growth at the industry and country level may facilitate debt finance of the affected subsidiaries. Finally, in regression (4) adjusted financial leverage is taken to be the dependent variable. In other respects, regression (4) mimics regression (3). The effective tax rate and debt shifting incentive variables continue to obtain positive and significant coefficients, albeit somewhat larger than before. Hence the adjustment of financial leverage for accounts payable and cash has little impact on the estimated impact of taxation on leverage. In regression (4), however, the tangibility variability enters with a positive coefficient to suggest that debt and tangible assets are complements (as firms can relatively easily borrow against tangible assets), while the political risk and growth opportunities variables cease to obtain significant coefficients.

The estimated coefficients of regression (3) can serve to evaluate the size of the effect of taxation on leverage. First, the estimated size of β_1, 0.18, indicates the full effect of domestic taxation on the leverage of firms. Specifically, the 'domestic' effect of an increase in the effective tax rate by 0.06 (or one standard deviation) on leverage is 1.1 percent. Next, the estimated size of β_2, 0.12, captures the 'international debt-shifting' effect of taxation on leverage. As an example, we can take a hypothetical multinational firm that has a single foreign subsidiary with assets of equal size to those of the parent firm. In this instance, an increase of the effective tax rate by 0.06 in the subsidiary country has a positive 'international' effect on leverage in the subsidiary country of 0.4 percent. The total effect of an increase of the effective tax rate by 0.06 on subsidiary leverage is now calculated to be 1.5 percent. In contrast, an increase in the effective tax in the parent country of 0.06 has a negative 'international' effect on leverage in the subsidiary of –1.5 percent.

Next, Table 9 presents some robustness checks, taking regression (3) in Table 8 as a starting point. In regression (1), we correct standard errors for clustering across country-industry observations. The estimated coefficients for the two tax variables are virtually unchanged from those of the benchmark regression. Regression (2) in turn limits the sample to subsidiaries in the manufacturing sector. In this regression, the estimated sizes of β_1 and β_2 are somewhat smaller, and much larger, respectively. The relatively large size of β_2 in regression (2) may reflect that manufacturing firms are relatively transparent. Hence, for these firms it may be relatively easy to borrow in one country against the assets located in other countries to explain that leverage in one country is relatively sensitive to international tax rate differences. Next, regression (3) limits the sample to foreign subsidiaries. This reduces the sample size to 23,296 subsidiaries rather than 49,248 in regression (3) in Table 8. Relative to the benchmark regression, the value of β_2 is very similar in magnitude at 0.138. In regression (4) we restrict the sample to subsidiaries of multinationals, i.e. of firms that have at least one

foreign subsidiary. The estimated size of β_1 and β_2 are very similar to the benchmark results. In regression (5) we exclude loss-making subsidiaries by dropping firms that have negative earnings before interest, taxes, depreciation and amortization. The reason for excluding loss-making firms is that these firms may be close to financial distress, which could alter their debt policy. The results are not qualitatively affected. In regression (6), we exclude Eastern European countries from the sample, as the coverage of subsidiaries in Eastern Europe is quite poor. This reduces the sample size to 48,444 subsidiaries, but does not alter our main results. Financial leverage can also be affected by firm-specific risk. In particular, riskier firms tend to be higher levered. In regression (7), we use the standard deviation of the firm's ratio of earnings before interest, taxes, depreciation and amortization (EBITDA) to total assets over the period 1994-2003 as a proxy for the riskiness of the firm. Consistent with capital structure theory, we find that financial leverage is positively correlated with risk. Controlling for risk, however, does not much alter the effect of our tax variables on leverage. We continue to find positive and statistically significant coefficients for β_1 and β_2, of about equal size as before. In regression (8), we control for financial development using the ratio of private credit to GDP rather than the index of creditor rights. While private credit to GDP does not enter significantly, unlike creditor rights did in previous regressions, our main results are not affected.

Finally, Table 10 reports several robustness checks where we alter the taxation variables. In regression (1) of Table 10, we control for the relative taxation of equity and internal debt of subsidiaries, or φ_i. We construct φ_i using information on corporate tax rates in the parent and subsidiary countries, withholding taxes on dividend and interest payments in the subsidiary country, and double tax relief conventions applied by the parent country to incoming dividend and interest payments. We find that φ_i does not enter significantly, and that our main results are not affected after controlling for the relative taxation of equity and internal debt of subsidiaries.

In regression (2), we include "intermediate" companies, i.e., subsidiaries that are also parent companies of other subsidiaries, in the sample. This increases the sample from 49,248 to 57,409 observations. Our main results on the effect of taxation on financial leverage are unaffected, but we no longer find an effect of political risk on financial leverage.

In regression (3), we assess whether there is a differential effect of our tax variables on leverage for intermediate companies and pure subsidiaries (i.e., subsidiaries that are not themselves parent companies). We find a negative coefficient for an included intermediate firm dummy variable, while the leverage of intermediate firms tends to respond relatively strongly to changes in the effective marginal tax rate. A heightened role for taxation to affect the leverage of intermediate firms is to be expected, if these firms are important in the overall tax planning of the firm. The tax incentive to shift debt abroad, however, is found to affect the leverage of intermediate and pure subsidiaries similarly.

In regression (4), we split the tax incentive to shift debt variable in one component that captures the incentive to shift debt to the parent country and another component that captures the incentive to shift debt to subsidiaries in other countries than the host and parent countries. Interestingly, we find that on average the incentives to shift debt to the parent country and to other countries both matter, although leverage appears to be more sensitive to the tax incentive to shift debt to other countries. These results imply that multinational firms not only consider tax-motivated debt shifting opportunities between a foreign subsidiary and the parent country, but also among the various foreign subsidiaries. This finding supports our thesis that multilateral - rather than bilateral - differences in tax rates determine the financial structure of multinational firms.

In regression (5), we split the effective tax rate variable in one part that captures the taxation in the source country (to be found by setting the tax rate of the parent country to zero) and the complement that captures the taxation in the resident country. Parent country taxes should matter relatively little to the extent that multinationals are able to defer parent country taxes on foreign-source income unless this income is repatriated to the parent country. We find that the source-country part of the effective tax rate has a positive and statistically significant impact on leverage, while the parent-country part obtains a negative and insignificant coefficient perhaps reflecting the option of deferral.

In regression (6), we split the two tax variables into parts that exclude and are specifically due to non-resident dividend withholding taxes. The first part is obtained by setting all withholding taxes to zero. The second part is obtained as the difference between our regular tax rate variables and the tax variables excluding withholding taxes. Interestingly, only the tax variables exclusive of withholding taxes are estimated with positive and significant coefficients. This suggests that withholding taxes are not seen as part of the effective tax burden, possibly because they can be avoided by triangular arbitrage involving a conduit company in a tax haven.

We are concerned about potential endogeneity that arises, if countries respond to pervasive debt shifting by changing their tax regimes (although tax regimes reflect a host of other factors as well). As larger countries tend to have higher tax rates, we use the populations of the subsidiary and parent countries as instruments in the construction of the effective tax rate variable. Specifically, we re-compute the effective tax rate using the populations of the subsidiary and the parent countries instead of these countries' tax rates, taking into account possible double tax relief and assuming withholding taxes are zero. Because we do not have separate instruments for the tax incentive to shift debt variable, we only include the effective tax rate in this robustness check. The results for this instrumental variables regression are very similar. The coefficient on the effective tax rate variable is statistically significant and of similar magnitude as in previous regressions. An F-test of the excluded instruments supports the choice of our instruments. The first-stage results (not reported) indicate that effective tax rates tend to be higher in more populous countries.

6. Conclusions

This paper has considered the sensitivity of the capital structure of multinational firms to taxation. Generally this capital structure depends on the national or international structure of the firm and on the tax systems of all the countries where a firm operates. On the basis of a large sample of European firms over the 1994-2003 period, we find that a firm's leverage depends on national tax rates as well as international tax rate differences. The relationship between leverage and international tax rates differences reflects the presence of international debt shifting. While statistically highly significant, both the 'domestic' and 'international' effects of taxation on leverage are rather small.

International debt shifting is shown to reflect a subsidiary's tax rates differences vis-à-vis the parent firm as well as vis-à-vis other foreign subsidiaries. This finding confirms our premise that international debt shifting reflects the tax regimes of all the countries where the multinational operates rather then just bilateral tax rate differences vis-à-vis the parent firm. In practice, source-level taxation appears to be more important in affecting leverage than the residence-level taxation levied by a multinational's parent country. This finding may reflect that parent-country taxes on a multinational's foreign source income in practice can be deferred, in some cases indefinitely. At the same time, corporate tax rates rather than non-

resident dividend withholding tax rates appear to matter for leverage. This could reflect that multinationals are able to avoid bilateral nonresident dividend withholding taxes by using conduit companies in third countries.

International debt shifting serves to lower average levels of corporate income taxation in high-tax countries. Countries with relatively low rates of taxation may benefit from international debt shifting, as local establishments of multinational firms will be less highly leveraged than they would otherwise be – resulting in higher corporate income tax revenues. Overall, international debt shifting may introduce some dead-weight losses in the form of implementation costs for the multinational firms and also costs inherent in deviations from the firm's optimal financial structure on the basis of non-tax considerations. An obvious way to eliminate international debt shifting is to harmonize top corporate income tax rates internationally. Alternatively, international debt shifting is moot in case countries introduce a common, consolidated tax base for multinational firms. Tax coordination of either kind is not very likely in the near future so that international debt shifting will remain an important policy for multinationals worldwide.

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Table 1. Corporate taxation and double-tax relief systems for dividend received in selected European countries in 2003.[13]

	Statutory corporate tax rate including local taxes and surcharges (%)	Treatment of foreign dividends from treaty countries	Treatment of foreign dividends from non-treaty countries
Austria	34	Exemption	Exemption
Belgium	33.99	95% exemption	95% exemption
Bulgaria	23.5	Indirect credit	Direct credit
Croatia	20	Exemption	Exemption
Cyprus	15	Exemption	Exemption
Czech Republic	31	Indirect credit	Deduction
Denmark	30	Exemption	Exemption
Estonia	26[14]	Indirect credit	Indirect credit
Finland	29	Exemption	Direct credit
France	35.43[15]	95% exemption	95% exemption
Germany	39.59[16]	95% exemption	95% exemption
Greece	35	Indirect credit	Indirect credit
Hungary	19.64[17]	Exemption	Exemption
Iceland	18	Exemption	Exemption
Ireland	12.5[18]	Indirect credit	Indirect credit

[13] We only show the data for the year 2003 but have collected data on tax rates for each year in our sample period. The complete dataset on the international tax data collected is available upon request from the authors.

[14] Zero percent on retained earnings. A distribution tax of 26% is applied on distributed profit.

[15] Including a 3% social surcharge and a special 3.3% surcharge for large companies.

[16] Including a solidarity surcharge of 5.5% and an average deductible trade tax of 16.14%. It also includes the exceptional 1.5% additional tax in 2003.

[17] Including a deductible local business tax.

[18] The rate is 25% for non-trading activities.

	Statutory corporate tax rate including local taxes and surcharges (%)	Treatment of foreign dividends from treaty countries	Treatment of foreign dividends from non-treaty countries
Italy	38.25	60% Exemption	60% Exemption
Latvia	19	Exemption	Exemption
Lithuania	15	Exemption	Exemption
Luxembourg	30.38[19]	Exemption	Exemption
Malta	35	Indirect credit	Indirect credit
Netherlands	34.5	Exemption	Exemption
Norway	28	Indirect credit	Indirect credit
Poland	27	Indirect credit[20]	Direct Credit
Portugal	33	Direct credit[21]	Direct credit
Romania	25	Indirect credit	Indirect credit
Russia	24	Direct credit	No relief
Slovak Republic	25	Indirect credit	No relief
Slovenia	25	Exemption	Exemption
Spain	35	Exemption	Indirect credit
Sweden	28	Exemption	Exemption
Switzerland	21.74[22]	Exemption	Exemption
Turkey	33	Indirect credit	Direct credit
United Kingdom	30	Indirect credit	Indirect credit

Note : Dividends are assumed to be paid by fully owned subsidiaries. Source : International Bureau of Fiscal Documentation.

[19] Including employment surcharge and local taxes.

[20] Indirect tax credit if holding 75% for two years and treaty and where the EU Parent-subsidiary directive holds.

[21] Exemption if EU Parent-Subsidiary directive applies (but foreign withholding tax is not creditable).

[22] Including cantonal and local taxes in Zurich.

Table 2. Bilateral withholding tax on dividend payments between fully owned foreign subsidiary and parent on 1st January 2003.

2003	OE	BE	BG	HR	CY	CZ	DK	EE	FI	FR	DE	GR	HU	IC	IE	IT	LV	LT	LU	MT	NL	NO	PL	PT	RO	RU	SK	SI	ES	SE	CH	TR	GB
Austria	X	0	0	0	10	10	0	5	0	0	0	0	10	25	0	0	25	25	0	15	0	5	10	0	15	5	10	5	0	0	0	25	0
Belgium	0	X	10	10	10	5	0	25	0	0	0	0	10	25	0	0	25	25	0	15	0	5	10	0	5	10	5	5	0	0	10	15	0
Bulgaria	0	10	X	5	5	10	5	15	10	5	15	10	10	15	5	10	15	15	5	0	5	15	10	10	10	15	10	15	5	10	5	10	10
Croatia	0	10	5	X	10	5	5	15	5	5	0	5	5	15	15	10	5	15	15	5	5	15	5	15	5	5	5	15	5	15	5	10	5
Cyprus	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech Rep.	10	5	10	5	10	X	15	5	5	10	5	15	5	5	5	15	5	5	5	5	0	5	5	10	10	10	5	5	5	0	5	15	5
Denmark	0	0	5	5	10	15	X	5	0	0	0	0	5	0	0	0	5	5	0	0	0	0	0	0	10	10	15	5	0	0	0	15	0
Estonia	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Finland	0	0	10	5	29	0	0	0	X	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	15	0
France	0	0	5	5	10	10	0	5	0	X	0	0	5	5	0	0	5	5	0	5	0	0	5	0	10	10	10	5	0	0	5	15	0
Germany	0	0	15	15	10	5	0	5	0	0	X	0	5	5	0	0	5	5	0	5	0	0	5	0	10	5	5	15	0	0	0	15	0
Greece	0	0	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hungary	10	10	10	10	5	5	5	20	5	5	5	10	X	20	5	10	20	20	5	5	5	10	10	10	5	10	5	10	5	5	10	10	5
Iceland	15	15	15	15	15	5	0	5	0	5	5	15	15	X	15	15	5	5	5	15	0	0	5	10	15	15	15	15	5	0	5	15	5
Ireland	0	0	0	20	0	0	0	0	0	0	0	20	0	20	X	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	20	0
Italy	0	0	10	10	15	15	0	5	0	0	0	0	10	27	0	0	27	5	0	15	0	15	10	0	10	5	15	10	0	0	15	15	0
Latvia	10	10	10	5	10	5	5	5	5	5	5	10	10	5	5	10	X	0	10	5	5	5	5	10	10	10	10	5	10	5	5	10	5
Lithuania	15	15	15	5	15	5	5	0	5	5	5	15	15	5	5	5	0	X	15	15	5	5	5	15	10	15	10	5	5	5	5	10	5
Luxembourg	0	0	0	20	20	0	0	20	0	0	0	0	0	0	0	0	20	20	X	0	0	0	0	0	0	0	0	0	0	0	0	20	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	0	0	5	0	25	0	0	5	0	0	0	0	5	0	0	0	5	5	0	5	X	0	0	0	0	5	0	5	0	0	0	5	0
Norway	5	15	15	15	0	5	0	5	0	0	0	20	10	0	0	15	5	5	5	15	0	X	5	10	10	10	5	15	10	0	5	20	5
Poland	10	10	10	5	10	5	5	5	5	5	5	15	10	5	0	10	5	5	5	5	0	5	X	10	5	10	5	5	5	5	5	10	5
Portugal	0	0	15	30	30	15	0	30	0	0	0	0	15	15	0	0	30	30	0	15	0	15	15	X	15	15	30	30	0	0	15	30	0
Romania	10	5	10	5	10	10	10	10	5	10	10	10	5	10	3	10	10	10	5	5	5	10	5	10	X	10	10	5	10	10	10	10	10
Russia	5	15	15	5	0	10	10	15	5	5	5	15	10	15	10	5	15	15	10	15	5	10	10	10	15	X	10	10	5	5	5	10	10
Slovak Rep.	10	5	10	5	10	5	15	15	5	10	5	15	5	15	0	15	10	10	5	5	0	5	5	15	10	10	X	5	5	0	5	5	5
Slovenia	5	5	15	15	10	5	5	15	5	5	15	15	10	15	5	10	5	5	5	15	5	15	5	15	15	10	5	X	5	5	5	15	5
Spain	0	0	5	15	15	5	0	15	0	0	0	0	5	5	0	0	15	15	0	15	0	10	5	0	5	5	5	5	X	0	10	15	0
Sweden	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	0	0	0
Switzerland	5	10	5	35	35	5	0	35	5	5	5	5	10	5	10	15	5	5	0	35	0	5	5	10	10	5	5	15	10	0	X	35	5
Turkey	16,5	16,5	16,5	11	16,5	16,5	16,5	16,5	16,5	16,5	16,5	16,5	11	16,5	16,5	16,5	16,5	11	16,5	16,5	16,5	16,5	11	16,5	16,5	11	5,5	16,5	16,5	16,5	16,5	X	16,5
United Kingdom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X

Notes : (a) The Parent-Subsidiary directive is binding between EU Member States and provides exemption from withholding tax when holding is at least 25%. (b) Ireland: companies located in EU or treaty countries are exempt from withholding tax provided that they are not under the control of persons not resident in such countries. (c) Estonia: general exemption from withholding tax if holding in foreign company is at least 25%. (d) Italy: if the recipient can prove a tax is paid in its country on the dividend, the Italian authorities can provide a refund equal to the tax claimed limited to 4/9 of the Italian withholding tax. (e) Lithuania: general exemption from withholding tax if holding in foreign company is at least 25%. (f) Luxembourg: exemption from withholding tax for EU and treaty partners if holding in foreign company is at least 10%. (g) Sweden: no withholding tax if holding is 25% and there is normal corporate taxation in the foreign country and if the shares are held for business-related reasons. Source: International Bureau of Fiscal Documentation.

Table 3. Existence of a bilateral tax treaty on January 1st 2003.

2003	OE	BE	BG	HR	CY	CZ	DK	EE	FI	FR	DE	GR	HU	IC	IE	IT	LV	LT	LU	MT	NL	NO	PL	PT	RO	RU	SK	SI	ES	SE	CH	TR	GB
OE	X	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
BE	1	X	1	1	1	1	1	0	1	1	1	1	1	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
BG	1	1	X	1	1	1	1	0	1	1	1	1	1	0	1	1	0	0	1	1	1	1	1	1	1	0	1	0	1	1	1	0	1
HR	1	1	0	X	0	1	1	0	1	1	1	1	1	0	0	1	1	1	0	0	1	1	1	0	1	1	1	0	0	1	0	0	1
CY	1	1	1	0	X	1	1	0	0	1	1	1	1	0	1	1	0	0	0	1	0	1	1	0	1	1	1	1	0	1	0	0	1
CZ	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1
DK	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1
EE	0	0	0	0	0	1	1	X	1	1	1	0	0	1	1	1	1	1	0	0	1	1	1	0	0	0	0	0	0	1	0	0	1
FI	1	1	1	1	0	1	1	1	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
FR	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
DE	1	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GR	1	1	1	1	1	1	1	0	1	1	1	X	1	0	1	1	0	0	1	0	1	1	1	1	1	0	1	0	1	1	1	0	1
HU	1	1	1	1	1	1	1	0	1	1	1	1	X	0	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
IC	0	0	0	0	0	1	1	1	1	1	1	0	0	X	0	0	1	1	1	0	1	1	1	1	0	0	0	0	1	1	1	0	1
IE	1	1	1	0	1	1	1	1	1	1	1	0	1	0	X	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1
IT	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	X	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
LV	0	0	0	1	0	1	1	1	1	1	1	0	0	1	1	0	X	1	0	0	1	1	1	0	1	0	1	1	0	1	1	0	1
LT	0	0	0	1	0	1	1	1	1	1	1	0	0	1	1	1	1	X	0	0	1	1	1	0	1	0	1	1	0	1	1	0	1
LU	1	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	0	0	X	1	1	1	1	1	1	1	1	1	1	1	1	0	1
MT	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	1	1	0	1	X	1	1	1	1	1	0	1	0	0	1	1	0	1
NL	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	1	1	1
NO	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	1	1
PL	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1	1	1	1	1
PT	1	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	X	1	1	1	0	1	0	1	0	1
RO	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	X	1	1	1	1	1	1	1	1
RU	1	1	1	1	1	1	1	0	1	1	1	0	1	0	1	1	0	0	1	0	1	1	1	1	1	X	1	0	1	1	1	1	1
SK	1	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	X	1	1	1	1	1	1
SI	1	1	0	0	1	1	1	0	1	1	1	0	1	0	1	1	1	1	1	0	1	1	1	0	1	1	1	X	1	1	1	0	1
ES	1	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	0	0	1	0	1	1	1	1	1	1	1	1	X	1	1	0	1
SE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X	1	1	1
CH	1	1	1	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X	0	1
TR	1	1	1	1	0	0	1	0	1	1	1	0	1	0	0	1	0	1	0	0	1	1	1	0	1	1	1	0	0	1	0	X	1
GB	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	X

Source: International Bureau of Fiscal Documentation, various ministries' websites.

Table 4. Bilateral withholding tax on interest payments between fully owned foreign subsidiary and parent on 1st January 2003

2003	OE	BE	BG	HR	CY	CZ	DK	EE	FI	FR	DE	GR	HU	IC	IE	IT	LV	LT	LU	MT	NL	NO	PL	PT	RO	RU	SK	SI	ES	SE	CH	TR	GB
Austria	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Belgium	15	X	10	15	10	10	15	15	10	15	15	10	15	15	15	15	15	15	15	10	10	15	10	15	10	10	10	10	15	10	10	15	15
Bulgaria	0	10	X	5	7	10	0	15	0	0	0	15	10	15	5	0	15	15	10	0	0	0	10	10	15	15	10	15	0	0	10	10	0
Croatia	5	15	5	X	10	0	0	15	0	0	0	10	0	15	15	10	10	10	15	0	0	0	10	15	10	10	10	15	15	0	5	10	10
Cyprus	0	0	0	0	x	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czech Rep.	0	10	10	0	10	X	0	10	0	0	0	10	0	0	0	0	10	10	0	0	0	0	10	10	7	0	0	5	0	0	0	15	0
Denmark	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Estonia	10	26	26	26	26	10	10	X	10	10	10	26	26	10	10	10	10	0	26	10	10	10	10	26	26	26	26	26	26	10	26	26	10
Finland	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
France	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Germany	0	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Greece	0	0	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hungary	0	15	10	0	10	0	0	18	0	0	0	10	X	18	0	0	18	18	0	10	0	0	10	10	15	0	0	0	0	0	10	10	0
Iceland	0	0	0	0	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ireland	0	0	0	20	0	0	0	0	0	0	0	0	0	20	X	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	20	0
Italy	0	0	0	0	0	0	0	0	0	0	0	0	0	12,5	0	X	12,5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Latvia	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	X	0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Lithuania	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Luxembourg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0	0
Norway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0	0	0	0	0	0	0
Poland	0	10	10	10	10	10	5	10	0	0	0	10	10	10	10	10	10	10	10	10	0	0	X	10	10	10	10	10	0	0	10	10	0
Portugal	10	15	10	20	20	10	10	20	15	12	15	15	10	10	15	15	20	20	15	10	10	15	10	X	10	10	20	20	15	20	10	20	10
Romania	10	10	10	7,5	10	7	10	10	5	10	10	10	10	10	3	10	10	10	10	5	0	10	10	10	X	10	10	7,5	10	10	10	10	10
Russia	0	15	20	10	0	0	0	20	0	0	0	20	0	20	0	10	20	20	0	20	0	10	10	10	20	X	0	10	5	0	10	10	0
Slovak Rep.	0	10	10	10	10	0	0	25	0	0	0	10	0	25	0	0	10	10	0	0	0	0	10	25	10	0	X	0	0	0	10	10	0
Slovenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	0	0	0	0	0
Spain	0	0	0	15	15	0	0	15	0	0	0	0	0	5	0	0	15	15	0	15	0	10	0	0	10	5	0	5	X	0	10	15	0
Sweden	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	0	0	0
Switzerland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	0	0
Turkey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	0
United Kingdom	0	15	0	10	10	0	0	10	0	0	0	30	0	0	0	10	10	10	0	10	0	0	0	10	10	0	0	10	12	0	0	15	X

Notes : (a) Ireland: interest paid to a 75% non-resident parent is deemed to be a dividend. (b) Spain: interest is generally exempt from tax in Spain provided the direct beneficiary is a resident in another EU Member State. (c) Estonia: 0% if rate in recipient country is not lower than 2/3 of the Estonia tax rate on interest of 26%. (d) Switzerland: no withholding tax on ordinary loans, 35% on bonds and deposits. (e)Turkey: exemption for government bonds and debentures, as well as loans obtained from foreign companies and institutions, (f) Italy: zero withholding tax with treaty countries for public bonds, private bonds, and deposits; 27% with non-treaty countries for deposits and private bonds of maturity of less than 18 months; 12.5% otherwise. Source: International Bureau of Fiscal Documentation.

Table 5. Double-tax relief systems for interest payments received in selected European countries in 2003

	Interest payments from treaty countries	Interest payments from non-treaty countries
Austria	Credit	Credit
Belgium	Credit	Credit 15/85th
Bulgaria	Credit	Credit
Croatia	Credit	Credit
Cyprus	50% exemption	50% exemption
Czech Republic	Credit	Deduction
Denmark	Credit	Credit
Estonia	Credit	Deduction
Finland	Credit	Credit
France	Credit	Deduction
Germany	Credit	Credit
Greece	Credit	Credit
Hungary	Credit	Credit
Iceland	Credit	Credit
Ireland	Credit	Credit
Italy	Credit	Credit
Latvia	Credit	Credit
Lithuania	Credit	Credit
Luxembourg	Credit	Credit
Malta	Credit	Credit
Netherlands	Credit	Credit
Norway	Credit	Credit
Poland	Credit	Credit
Portugal	Credit	Credit
Romania	Credit	Credit

	Interest payments from treaty countries	Interest payments from non-treaty countries
Russia	Credit	Credit
Slovak Republic	Credit	No relief
Slovenia	Credit	Credit
Spain	Credit	Credit
Sweden	Credit	Credit
Switzerland	Credit	Deduction
Turkey	Credit	Credit
United Kingdom	Credit	Credit

Source: International Bureau of Fiscal Documentation.

Table 6. Expressions for φ_i or the relative taxation of equity and internal debt of subsidiaries.

Treatment of - Debt - / - Equity -	**Exemption**	**Credit**	**Deduction**
Exemption	$t_i + w_i^e - t_i w_i^e - w_i^d$	$t_i + w_i^e - t_i w_i^e - \max[w_i^d, t_p]$	$t_i + w_i^e - t_i w_i^e - [t_p + w_i^d - t_p w_i^d]$
Indirect credit	$\max\left[t_i + w_i - t_i w_i^e, t_p\right] - w_i^d$	$\max\left[t_i + w_i - t_i w_i^e, t_p\right] - \max\left[w_i^d, t_p\right]$	$\max\left[t_i + w_i - t_i w_i^e, t_p\right] - [t_p + w_i^d - w_i^d t_p]$
Direct credit	$t_i + (1-t_i)\max[t_p, w_i^e] - w_i^d$	$t_i + (1-t_i)\max[t_p, w_i^e] - \max\left[w_i^d, t_p\right]$	$t_i + (1-t_i)\max[t_p, w_i^e] - [t_p + w_i^d - w_i^d t_p]$
Deduction	$1 - (1-t_i)(1-w_i^e)(1-t_p) - w_i^d$	$1 - (1-t_i)(1-w_i^e)(1-t_p) - \max[w_i^d, t_p]$	$1 - (1-t_i)(1-w_i^e)(1-t_p) - [t_p + w_i^d - t_p w_i^d]$

Table 7. Descriptive Statistics for Subsidiaries of European Multinationals

Panel A lists the number of parent companies and subsidiaries (by home and host country) in the sample. Intermediary companies, that are both parent firms and subsidiaries, are counted as subsidiaries only. Domestic subsidiaries are counted as subsidiaries by home country only. Panel B presents the sample averages of financial leverage and tax variables. Panel C presents the summary statistics for the financial leverage, tax, and other variables for subsidiaries only. Financial leverage is the ratio of total liabilities to total assets. Adjusted financial leverage is the ratio of total liabilities minus accounts payables minus cash to total assets minus accounts payables minus cash. Effective marginal tax rate (τ) is the statutory tax rate on dividend income generated in the subsidiary country, taking withholding taxes and the tax system for foreign source income into account. Tax incentive to shift debt is the sum of international tax differences between subsidiary countries weighted by subsidiary asset shares, taking withholding taxes and the international tax system into account. Tangibility is the ratio of subsidiary fixed assets to subsidiary total assets. Log of sales is the logarithm of subsidiary sales. Profitability is the ratio of subsidiary earnings before interest, taxes, depreciation and amortization to subsidiary total assets. Creditor rights is the annual index of credit rights in the country from Djankov et al. (2005). Political risk is the annual (December) index of political risk from the International Country Risk Guide. We inverted the scale from 0-100 with higher scores indicating greater risk. Inflation is the annual percentage change in the CPI of the subsidiary's host country from the World Development Indicators. Growth opportunities is the median of the annual growth rate of subsidiary sales in a subsidiary's country and industry. Sample consists of parent companies and subsidiaries of European firms in Amadeus. We have up to 10 years of data for each parent company and subsidiary. The total number of parent-year observations is 38,736, and the total number of subsidiary-year observations is 90,599.

Panel A: Number of parent companies and subsidiaries

Country	Number of parent companies: by home country	Number of subsidiaries: by home country	Number of subsidiaries: by host country
Austria	32	75	67
Belgium	538	1,168	1,322
Bulgaria	38	92	13
Croatia	0	0	25
Cyprus	0	0	1
Czech Republic	2	2	58
Denmark	282	595	493
Estonia	10	22	33
Finland	132	307	352
France	582	1,586	1,313
Germany	321	974	657
Greece	163	369	250
Hungary	11	17	67
Iceland	22	45	56
Ireland	56	118	94
Italy	567	928	954
Latvia	2	7	11
Lithuania	5	7	9
Luxembourg	5	9	21
Netherlands	429	884	563
Norway	159	384	623
Poland	32	50	135
Portugal	70	127	255
Romania	2	3	54
Russia	8	12	5
Slovak Republic	3	8	4
Slovenia	17	27	6
Spain	933	2,071	2,573
Sweden	595	1,194	1,030
Switzerland	48	76	59
United Kingdom	727	2,150	2,204
Total	5,791	13,307	13,307

Panel B: Financial leverage and marginal tax rates

Country	Financial leverage		Adjusted financial leverage		Effective marginal tax rate	Tax incentive to shift debt
	Parent companies: by home country	Subsidiaries: by host country	Parent companies: by home country	Subsidiaries: by host country	Subsidiaries: by host country	Subsidiaries: by host country
Austria	0.58	0.61	0.52	0.56	0.34	-0.033
Belgium	0.66	0.66	0.50	0.51	0.40	0.016
Bulgaria	0.56	0.42	0.43	0.33	0.30	-0.004
Croatia		0.48			0.32	-0.006
Cyprus		0.15		0.06	0.35	0.002
Czech Republic	0.47	0.45	0.27	0.22	0.42	0.004
Denmark	0.62	0.65	0.54	0.57	0.31	-0.003
Estonia	0.49	0.50	0.26	0.27	0.14	-0.153
Finland	0.56	0.55	0.45	0.46	0.29	-0.021
France	0.60	0.63	0.43	0.46	0.37	0.001
Germany	0.65	0.66	0.58	0.60	0.49	0.043
Greece	0.54	0.55	0.38	0.38	0.42	0.036
Hungary	0.50	0.49	0.40	0.43	0.26	-0.114
Iceland	0.57	0.63	0.47	0.57	0.43	0.080
Ireland	0.59	0.58	0.41	0.43	0.26	-0.029
Italy	0.73	0.70	0.61	0.58	0.45	0.027
Latvia	0.71	0.62	0.47	0.38	0.33	0.018
Lithuania	0.60	0.56	0.46	0.32	0.28	-0.003
Luxembourg	0.68	0.58	0.59	0.48	0.37	-0.007
Netherlands	0.63	0.63	0.52	0.52	0.35	-0.001

Norway	0.63	0.63	0.52	0.51	0.33	-0.004
Poland	0.56	0.54	0.37	0.40	0.35	-0.009
Portugal	0.63	0.63	0.54	0.50	0.37	0.005
Romania	0.80	0.52	0.59	0.37	0.37	-0.002
Russia	0.36	0.48	0.18	0.17	0.35	0.015
Slovak Republic	0.48	0.48	0.33	0.34	0.42	0.012
Slovenia	0.36	0.40			0.37	-0.025
Spain	0.61	0.60	0.45	0.45	0.35	0.000
Sweden	0.61	0.62	0.51	0.53	0.29	-0.011
Switzerland	0.52	0.58	0.37	0.49	0.31	-0.027
United Kingdom	0.57	0.62	0.44	0.50	0.31	-0.017
Total	0.62	0.62	0.49	0.49	0.36	0.001

Panel C: Summary statistics of leverage, tax, and control variables

Variable	Number of observations	Average	Standard Deviation	Minimum	Maximum
Financial leverage	90,599	0.62	0.21	0.00	1.00
Adjusted financial leverage	86,516	0.49	0.27	0.00	1.00
Effective marginal tax rate	90,599	0.36	0.06	0.00	0.67
Tax incentive to shift debt	66,462	0.00	0.05	-0.49	0.42
Tangibility	90,233	0.38	0.26	0.00	1.00
Log of sales	81,747	10.40	1.93	0.00	18.56
Profitability	74,812	0.11	0.19	-10.13	28.03
Creditor rights	89,945	2.07	1.18	0.00	4.00
Political risk	90,517	16.56	5.86	3.00	57.00
Inflation	90,599	2.64	3.78	-1.18	154.76
Growth opportunities	78,310	0.00	0.42	-7.26	14.00

Table 8. The Impact of Domestic and International Taxes on the Financial Leverage of Subsidiaries of Multinational Firms

The dependent variable in columns (1) to (3) is the ratio of subsidiary total liabilities to subsidiary total assets. The dependent variable in column (4) is the ratio of total liabilities minus accounts payables minus cash to total assets minus accounts payables minus cash. Effective marginal tax rate (τ) is the statutory tax rate on dividend income generated in the subsidiary country, taking withholding taxes and the tax system for foreign source income into account. Tax incentive to shift debt is the sum of international tax differences between subsidiary countries weighted by subsidiary asset shares, taking withholding taxes and the international tax system into account. Tangibility is the ratio of subsidiary fixed assets to subsidiary total assets. Log of sales is the logarithm of subsidiary sales. Profitability is the ratio of subsidiary earnings before interest, taxes, depreciation and amortization to subsidiary total assets. Creditor rights is the annual index of credit rights in the country from Djankov et al. (2005). Political risk is the annual (December) index of political risk from International Country Risk Guide. We inverted the scale from 0-100 with higher scores indicating greater risk. Inflation is the annual percentage change in CPI of the subsidiary's host country from World Development Indicators. Growth opportunities is the median of the annual growth rate of subsidiary sales in a subsidiary's country and industry. Sample consists of subsidiaries of European companies in Amadeus. All regressions are estimated using OLS and include parent, industry, and year fixed effects. We report White (1980)'s heteroskedasticity-consistent standard errors between brackets. * denotes significance at 10%; ** significance at 5%; and *** significance at 1%.

	(1) Financial leverage	(2) Financial leverage	(3) Financial leverage	(4) Adjusted financial leverage
Effective marginal tax rate	0.259***	0.162***	0.184***	0.195***
	(0.017)	(0.031)	(0.033)	(0.044)
Tax incentive to shift debt		0.132***	0.120***	0.178***
		(0.031)	(0.033)	(0.045)
Tangibility	-0.130***	-0.123***	-0.120***	0.105***
	(0.005)	(0.006)	(0.006)	(0.008)
Log of sales	0.022***	0.023***	0.023***	0.022***
	(0.001)	(0.001)	(0.001)	(0.001)
Profitability	-0.062**	-0.055**	-0.060*	-0.081*
	(0.025)	(0.027)	(0.032)	(0.042)
Creditor rights			0.006***	0.019***
			(0.001)	(0.002)
Political risk			0.001***	-0.000
			(0.000)	(0.000)
Inflation			-0.001***	-0.002***
			(0.000)	(0.000)
Growth opportunities			0.021***	0.010
			(0.008)	(0.009)
Parent, industry, and year fixed effects	Y	Y	Y	Y
Number of observations	71,355	52,310	49,248	47,511
Number of parent companies	5,566	5,118	5,064	5,016
R-squared	0.08	0.08	0.08	0.05

Table 9. The Impact of Taxes on the Financial Leverage of Subsidiaries of Multinational Firms: Robustness Checks

The dependent variable is the ratio of subsidiary total liabilities to subsidiary total assets. Effective marginal tax rate (τ) is the statutory tax rate on dividend income generated in the subsidiary country, taking withholding taxes and the tax system for foreign source income into account. Tax incentive to shift debt is the sum of international tax differences between subsidiary countries weighted by subsidiary asset shares, taking withholding taxes and the international tax system into account. In column (1), we correct standard errors correct for clustering across country-industry observations. In column (2), we only include subsidiaries operating in the manufacturing industries. In column (3), we only include the subset of foreign subsidiaries. In column (4), we only include subsidiaries of multinational companies. In column (5), we exclude subsidiaries with negative earnings before interest, taxes, depreciation and amortization. In column (6), we exclude Eastern European countries from the sample. In column (7), we include the standard deviation of the firm's EBITDA over the period 1994-2003 as a measure of firm-specific risk. In column (8), we control for financial development using the ratio of private credit to GDP rather than the index of creditor rights. Tangibility is the ratio of subsidiary fixed assets to subsidiary total assets. Log of sales is the logarithm of subsidiary sales. Profitability is the ratio of subsidiary earnings before interest, taxes, depreciation and amortization to subsidiary total assets. Creditor rights is the annual index of credit rights in the country from Djankov et al. (2005). Political risk is the annual (December) index of political risk from the International Country Risk Guide. We inverted the scale from 0-100 with higher scores indicating greater risk. Inflation is the annual percentage change in the CPI of the subsidiary's host country from the World Development Indicators. Growth opportunities is the median of the annual growth rate of subsidiary sales in a subsidiary's country and industry. Volatility of profits is the standard deviation of the firm's ratio of earnings before interest, taxes, depreciation and amortization (EBITDA) to total assets over the period 1994-2003. Sample consists of subsidiaries of European companies in Amadeus. All regressions are estimated using OLS and include parent, industry, and year fixed effects. We report White (1980)'s heteroskedasticity-consistent standard errors between brackets. * denotes significance at 10%; ** significance at 5%; and *** significance at 1%.

	(1) Clustering	(2) Manufacturing	(3) Foreign	(4) Multinationals	(5) Exclude loss-making firms	(6) No Eastern Europe	(7) Firm-specific risk	(8) Financial development
Effective marginal tax rate	0.184***	0.139***	0.241***	0.193***	0.212***	0.180***	0.186***	0.184***
	(0.053)	(0.046)	(0.045)	(0.041)	(0.034)	(0.033)	(0.033)	(0.033)
Tax incentive to shift debt	0.120***	0.264***	0.138***	0.122***	0.108***	0.090***	0.116***	0.130***
	(0.045)	(0.048)	(0.040)	(0.037)	(0.034)	(0.033)	(0.033)	(0.033)
Tangibility	-0.120***	-0.080***	-0.116***	-0.115***	-0.115***	-0.113***	-0.119***	-0.119***
	(0.014)	(0.010)	(0.009)	(0.007)	(0.006)	(0.006)	(0.006)	(0.006)
Log of sales	0.023***	0.019***	0.018***	0.020***	0.021***	0.023***	0.023***	0.023***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Profitability	-0.060**	-0.131***	-0.144***	-0.052	-0.054	-0.058*	-0.069**	-0.060*
	(0.030)	(0.023)	(0.015)	(0.036)	(0.035)	(0.031)	(0.028)	(0.032)
Creditor rights	0.006**	0.010***	0.017***	0.007***	0.007***	0.006***	0.006***	
	(0.003)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	
Political risk	0.001*	0.001**	0.001**	0.001***	0.001***	0.001***	0.001***	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	-0.001**	-0.002***	-0.001***	-0.001***	-0.001***	0.004***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Growth opportunities	0.021***	0.014	0.039***	0.029***	0.030***	0.025***	0.021***	0.022***
	(0.006)	(0.010)	(0.009)	(0.008)	(0.007)	(0.009)	(0.008)	(0.008)
Volatility of profits							0.035***	
							(0.013)	

	(1) Clustering	(2) Manufacturing	(3) Foreign	(4) Multinationals	(5) Exclude loss-making firms	(6) No Eastern Europe	(7) Firm-specific risk	(8) Financial development
Private credit to GDP								-0.000
								(0.000)
Parent, industry, and year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Number of observations	49,248	19,397	23,296	30,187	44,410	48,444	48,512	47,997
Number of parent companies	5,064	2,416	2,844	2,883	4,882	4,967	4,847	5,105
R-squared	0.08	0.06	0.09	0.08	0.08	0.08	0.09	0.08

Table 10. The Impact of Taxes on the Financial Leverage of Subsidiaries of Multinational Firms: Additional Robustness Checks

The dependent variable is the ratio of subsidiary total liabilities to subsidiary total assets. Effective marginal tax rate (τ) is the statutory tax rate on dividend income generated in the subsidiary country, taking withholding taxes and the tax system for foreign source income into account. Tax incentive to shift debt is the sum of international tax differences between subsidiary countries weighted by subsidiary asset shares, taking withholding taxes and the international tax system into account. In column (1), we control for the relative taxation of equity and internal debt of subsidiaries (φ). In column (2), we include "intermediate" companies, i.e., subsidiaries that are also parent companies of other subsidiaries, in the sample. In column (3), we assess whether there is a differential effect of our tax variables on leverage for intermediate companies and pure subsidiaries. In column (4), we split the tax incentive to shift debt variable in one component that captures the incentive to shift debt to the parent country and another component that captures the incentive to shift debt to subsidiaries in other countries than the host and parent country. In column (5) we split the effective marginal tax rate variable in one component that captures the taxation in the source country (i.e., by setting the tax rate of the parent to zero) and one component that captures the taxation in the resident country. In column (6), we split both tax variables in one component that does not depend on withholding taxes and another component that depends on withholding taxes. In column (7), we use the population of the subsidiary country and the population of the parent country as instruments for the effective marginal tax rate. Taking the tax system into account and assuming that withholding taxes are zero. Tangibility is the ratio of subsidiary fixed assets to subsidiary total assets. Log of sales is the logarithm of subsidiary sales. Profitability is the ratio of subsidiary earnings before interest, taxes, depreciation and amortization to subsidiary total assets. Creditor rights is the annual index of credit rights in the country from Djankov et al. (2005). Political risk is the annual (December) index of political risk from the International Country Risk Guide. We inverted the scale from 0-100 with higher scores indicating greater risk. Inflation is the annual percentage change in the CPI of the subsidiary's host country from the World Development Indicators. Growth opportunities is the median of the annual growth rate of subsidiary sales in a subsidiary's country and industry. Sample consists of subsidiaries of European companies in Amadeus. All regressions are estimated using OLS and include parent, industry, and year fixed effects. We report White (1980)'s heteroskedasticity-consistent standard errors between brackets. * denotes significance at 10%; ** significance at 5%; and *** significance at 1%.

	(1) Relative taxation of equity and debt	(2) Include intermediate companies	(3) Differential effect for intermediate companies	(4) Shifting to parent country versus other countries	(5) Source versus resident tax	(6) Withholding taxes	(7) Instrumental variables
Effective marginal tax rate	0.184***	0.164***	0.149***	0.178***			0.200***
	(0.034)	(0.030)	(0.031)	(0.033)			(0.064)
Tax incentive to shift debt	0.120***	0.149***	0.154***		0.112***		
	(0.044)	(0.030)	(0.031)		(0.033)		
Relative tax of equity and debt	0.001						
	(0.043)						
Intermediate			-0.045**				
			(0.017)				
Intermediate * Effective marginal tax rate			0.090*				
			(0.047)				
Intermediate * Tax incentive to shift debt			-0.065				
			(0.087)				
Tax incentive to shift debt to parent country				0.086**			
				(0.037)			
Tax incentive to shift debt to other countries				0.215***			
				(0.065)			
Source effective marginal tax rate					0.188***		
					(0.033)		
Resident effective marginal tax rate					-0.186		
					(0.116)		
Effective marginal tax rate excl. withholding taxes						0.184***	

	(1) Relative taxation of equity and debt	(2) Include intermediate companies	(3) Differential effect for intermediate companies	(4) Shifting to parent country versus other countries	(5) Source versus resident tax	(6) Withholding taxes	(7) Instrumental variables
						(0.033)	
Tax incentive to shift debt excl. withholding taxes						0.133***	
						(0.033)	
Effective marginal tax rate due to withholding taxes						0.162	
						(0.173)	
Tax incentive to shift debt due to withholding taxes						-0.115	
						(0.167)	
Tangibility	-0.120***	-0.134***	-0.133***	-0.120***	-0.120***	-0.119***	-0.127***
	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.004)
Log of sales	0.023***	0.022***	0.022***	0.023***	0.023***	0.023***	0.023***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Profitability	-0.060*	-0.065**	-0.065**	-0.060*	-0.060*	-0.060*	-0.066***
	(0.032)	(0.029)	(0.030)	(0.032)	(0.032)	(0.032)	(0.004)
Creditor rights	0.006***	0.005***	0.005***	0.006***	0.006***	0.007***	0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Political risk	0.001***	0.000	0.000	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation	-0.001***	-0.001**	-0.001**	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Growth opportunities	0.021***	0.011*	0.012*	0.022***	0.022***	0.022***	0.012***
	(0.008)	(0.006)	(0.006)	(0.008)	(0.008)	(0.008)	(0.005)

	(1) Relative taxation of equity and debt	(2) Include intermediate companies	(3) Differential effect for intermediate companies	(4) Shifting to parent country versus other countries	(5) Source versus resident tax	(6) Withholding taxes	(7) Instrumental variables
F-test of excluded instruments (p-value)							0.000***
Parent, industry, and year fixed effects	Y	Y	Y	Y	Y	Y	Y
Number of observations	49,248	57,409	57,409	49,248	49,248	49,248	65,120
Number of parent companies	5,064	5,236	5,236	5,064	5,064	5,064	5,502
R-squared	0.08	0.09	0.09	0.08	0.08	0.08	0.10

Appendix. Variable definitions and data sources

Variable	Definition	Source
Financial leverage	Ratio of total liabilities to total assets	Amadeus
Adjusted financial leverage	Ratio of total liabilities minus accounts payable minus cash to assets minus accounts payable minus cash	Amadeus
Effective marginal tax rate	Statutory tax rate on dividend income taking into account withholding taxes and international tax system	International Bureau of Fiscal Documentation and various ministries
Tax incentive to shift debt	Sum of international tax differences weighed by local asset shares taking into account withholding taxes and international tax system	International Bureau of Fiscal Documentation and various ministries
Relative tax of equity and debt	Statutory tax rate on dividend income minus statutory tax rate on interest income taking into account withholding taxes and international tax system	International Bureau of Fiscal Documentation and various ministries
Tangibility	Ratio of fixed assets to total assets	Amadeus
Log of sales	Logarithm of sales	Amadeus
Profitability	Ratio of earnings before interest, taxes, depreciation and amortization to total assets	Amadeus
Intermediate	Dummy variable flagging subsidiary firm that is also parent firm	Amadeus
Creditor rights	Annual index of credit rights in the country	Djankov et al. (2005)
Political risk	Annual (December) index of political risk. On a scale from 0-100 with higher scores indicating greater risk	International Country Risk Guide
Inflation	Annual percentage change in the CPI	World Development Indicators
Growth opportunities	Median of the annual growth rate of sales per country and industry.	Amadeus
Volatility of profits	Standard deviation of the firm's ratio of earnings before interest, taxes, depreciation and amortization (EBITDA) to total assets over the period 1994-2003	Amadeus
Private credit to GDP	Ratio of credit to the private sector to GDP	World Development Indicators